

THE RAYMONDIONYMINE WEEVILS OF CALIFORNIA,
WITH A DESCRIPTION OF A NEW GENUS, AND
SEVERAL NEW SPECIES

(Coleoptera: Curculionidae)

EDWARD E. GILBERT

University of California, Berkeley

An investigation of the distribution of the weevil, *Shizomicrus* Casey, in the northern California coastal redwood forests has led to the discovery of a new genus, with two new species, and two new species of the Old World weevil genus *Raymondionymus* Wollaston. In order to trace the possible evolution of the Raymondionyminae, an attempt has been made to evaluate the morphological characteristics of the new genus and species and to correlate these with existing New and Old World related genera. In the course of this study, morphological evidence has suggested that *Shizomicrus* is best regarded as a subgenus of *Raymondionymus*.

Alaocybites Gilbert, new genus

Body elongate, moderately convex, not depressed, covered with sparsely placed, erect, yellow hairs, which form single series on the elytral intervals; punctures usually encrusted with dirt. Head globular; eyes wanting; beak evenly arcuate; four-fifths the length of prothorax; viewed laterally, equal in thickness throughout, the base dorsally separated from the head by a slight constriction; viewed dorsally, base of antennal insertion prominent as a small arcuate ridge, which begins at apical lateral margin of beak, becomes dorsally sinuate, to form the basal margin of apical half of scrobe; viewed ventrally, without a median carina; scrobes deep, almost straight, bordered dorsally by a small carina. Antennae inserted at apical third, insertion visible from above; scape elongate claviform; attaining side of head; funicle seven-segmented; club obconical, first segment subequal to one half total length, the sutures marked by dense decumbent hairs; antennal hairs becoming increasing more dense distally. Prothorax straight, or slightly flexed upward; pronotum longer than wide, greatest width at middle, apex and base equal in width; pronotal punctures large, slightly separated, except along apical margin where there is a band of smaller punctures; band laterally narrower, mid dorsally extended more posteriorly. Scutellum absent. Elytra subconnate; the bases broadly and arcuately emarginate, not receiving the prothorax; humeral angles rounded, not prominent; elytral length more than twice that of prothorax, less than twice their combined width, which is less than twice that of prothorax at widest point; sides evenly subarcuate to greatest width at middle; strial punctures large and deep; intervals narrower than striae, slightly elevated, convex, with small punctures in a single series, distantly separated, each with an erect yellow hair arising from the center. *Prosternum* long, tumid before coxae to at least apical fourth. *Mesosternum* slightly depressed anteriorly. Meta-

and meso- sterna moderately convex, together shorter than prosternum. Sternal punctures deep, only slightly separated, usually laterally coalesced medially. Abdomen long, the first two segments long, subequal, separated by a fine suture, at least feebly impressed in female, strongly in the male; third, fourth and fifth sutures deeply impressed, so that both third and fourth segments, when viewed laterally, are anteriorly impressed, and form oblique angles with the rest of the abdomen, fifth segment as long as the third and fourth combined; punctures on the first and second abdominal segments large and deep, slightly separated laterally, widely so medially; punctures smaller on the third and fourth abdominal segments and arranged in lateral rows; punctation extremely fine, surface more glabrous on fifth abdominal segment, which is more translucent, and covered with sparsely placed erect yellow hairs, that are similar in length and insertion to those on elytral intervals. Other pubescence on venter white, very fine, and originating from the side of large punctures. Legs long; coxae with sparsely placed erect, yellow hairs, similar to those on elytra and fifth abdominal segment; fore coxae contiguous, mid coxae subcontiguous, hind coxae separated by their own width; femora slightly clavate, deeply and coarsely punctate, not grooved ventrally, hind femora flattened interiorly; tibiae long, slightly compressed, strongly rugose in sculpture; grooved dorso- apically for reception of tarsi; fore tibiae elongate wedge-shaped, external apical margin round, carinate and fimbriate; the internal angle slightly dilated and mucronate; mid and hind tibiae more subparallel, internal lateral border of tarsal grooves fimbriate; ventral tibial apical angle not dilated, but mucronate; tibial apices crowned with minute teeth. Tarsi small, the first three segments subequal; third segment not dilated, but apically emarginate; fourth tarsal segment less than one half longer than third. Pubescence on the legs increasing in density distally, very dense on tarsi. Claws simple, free and divergent.

Type of genus: *Alaocybites californica* Gilbert, new species.

A comparative discussion of the specific and generic characters, and the probable interrelationships of the New and Old World Raymondionyminae is presented towards the end of this paper. Suffice it to say, the genus *Alaocybites* is close to the European *Alaocyba* Perris. It differs from *Alaocyba* by having the body moderately convex rather than depressed, the antennal scrobes directed along the side of the beak rather than directed under the beak, the antennal funicle with seven rather than six segments; the area before the fore coxae tumid rather than convex, the metasternum anteriorly depressed instead of being on the same plane with the other sterna, and by having the mid and hind tibiae, as well as the fore tibiae, simple instead of broadly and triangularly dilated.

Alaocybites has been found in redwood litter in the northern

coast district of California, from Mendocino to Del Norte County, and includes the following two species.

***Alaocybites californica* Gilbert, new species**

(Plate I, A-C)

Body shining; head, coxae, fifth abdominal segment, prothorax, and distal appendages shining, translucent, light red-brown, rest of body darker and more opaque; pronotum with a subapical and basal, elytra with basal, black border. Head subglabrous, finely and sparsely punctured, without setae; head, viewed dorsally, not at all hidden by pronotum; beak with median subimpunctate line, lateral punctures linear striate from base to antennal insertion; scrobes completely lateral; antennae with first segment shorter than second and third combined, third through seventh segments equal in length and gradually wider. Prothorax with anterior lateral margin sinuate and almost horizontal; pronotum sinuate apically, sides evenly arcuate, feebly constricted apically and basally; pronotal punctures slightly, but not uniformly separated, apical band of small punctures narrow, limited to margin except mid dorsally, where they are slightly extended posteriorly. Elytra with sides from middle to apex narrowly arcuate, not at all constricted; punctures on humeral angle confused. Prosternum tumid to apical fifth, apical margin merely sinuate, not deeply and arcuately emarginate. Distal half of hind tibiae with posterior lateral margin sinuate, carinate towards apex and with fimbriae bordering margin. Length, excluding beak, 2.3 mm., width 0.8 mm.

Although the type specimen is one of the lighter, and more shining individuals of the series before me, the banding of the pronotum and elytra remain consistent. In darker individuals the pronotum may become similar to the elytra in both coloration and opaqueness. The pronotal apical band of small punctures is feebly developed in the mid dorsal area of the type, but in other individuals the mid dorsal punctures may extend posteriorly to the apical fifth, and delimit an area triangular or semi-circular in form. There is a variation in length from 1.7 mm. to 2.9 mm., and in width from 0.6 mm. to 1.1 mm.

Holotype female and allotype male (Calif. Acad. Sci., Ent.) and twenty-two paratypes. The holotype and one paratype collected August 13, 1953 by G. A. Marsh and R. O. Schuster, the allotype and five paratypes collected September 19, 1953 by R. O. Schuster and E. E. Gilbert 18 MILES SOUTH OF KLAMATH, DEL NORTE COUNTY, CALIFORNIA. Ten paratypes collected March 7, 1954, one paratype collected July 29, and one paratype collected July 31 by J. Helfer at Caspar, Mendocino County, California. Four additional paratypes: one from Mendocino, December 19, two from four miles east of Fort Bragg, December 24, and one

from Navarro ridge road, December 26, 1954 all collected by J. Helfer in Mendocino County, California.

The paucity of specimens from Del Norte County does not reflect collecting for only eight specimens were taken from over two hundred pounds of litter. In Mendocino County sixteen specimens were taken from less than one hundred pounds of litter. This may reflect that the deeper litter, in which the specimens were collected, is more abundant and widely distributed in Del Norte than Mendocino County, or that the species is reaching the northern limits of its distribution. The latter is deemed more evident from the geographic location of the following new species.

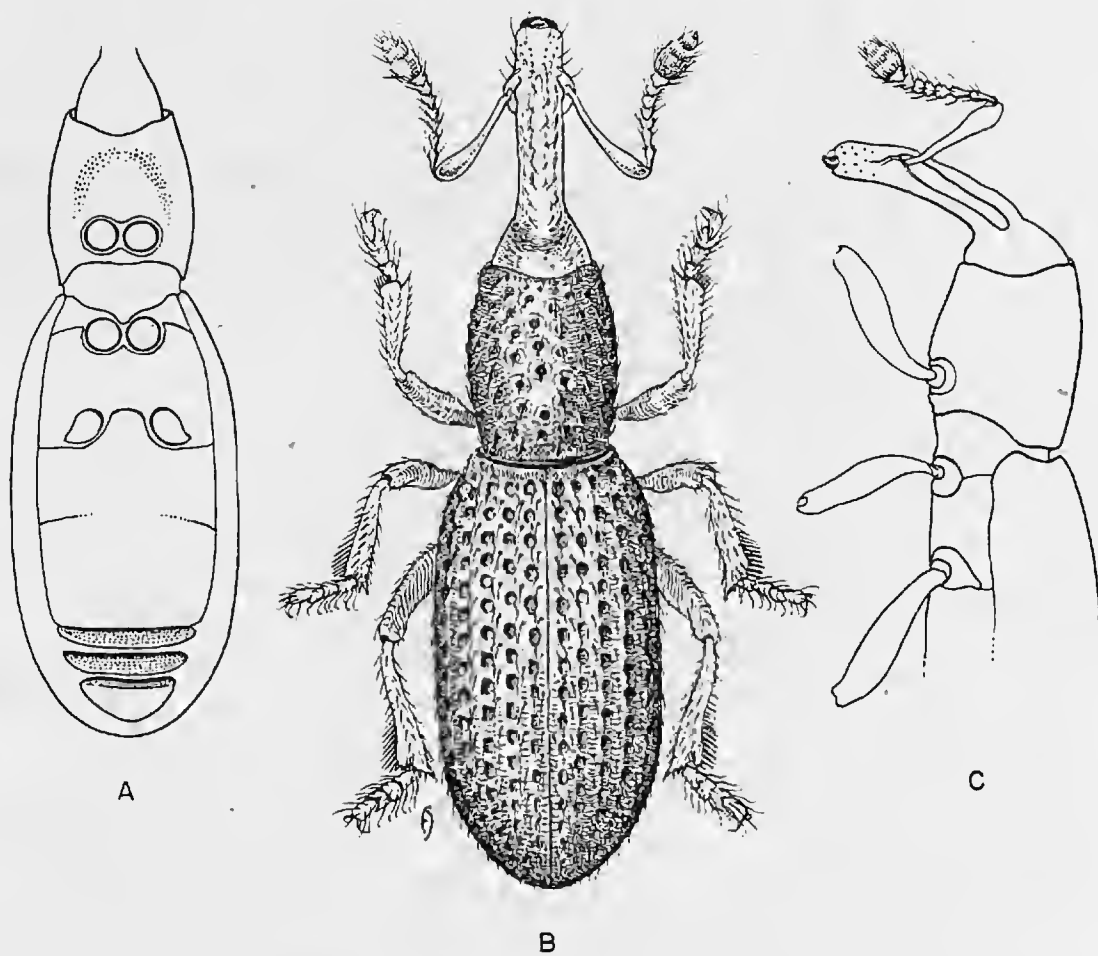
Alaocybites rothi Gilbert, new species

Body dull, antennae and distal appendages, shining, translucent, light red-brown; head, coxae, and fifth abdominal segment light red-brown, but more opaque and finely rugose, rest of body darker; prothorax with a band of light red along apical margin, that is triangular in form, widest medially, extending there to apical fifth; both pronotum and elytra without distinguishable black borders. Head closely punctate, with fine sparsely placed setae; head view dorsally, almost completely hidden by pronotum; beak without a median subimpunctate line, uniformly coarse and rugose to antennal insertion; antennae with first segment larger than second and third combined, second only slightly larger than third, third through seventh subequal in length and width. Prothorax with anterior lateral margin straight, and horizontally oblique; pronotum subtruncate apically, apical fifth constricted, parallel, abruptly swollen from apical fifth to middle, then evenly arcuate to base; pronotal punctures subcontiguous, apical band of small punctures wide, limited to constriction, except mid dorsally, where they extend posteriorly slightly beyond constriction. Elytra with sides from middle to apex broadly arcuate, constricted near apex; punctures on humeral angle linear, not confused. *Prosternum* tumid to apical fourth, apical margin deeply and arcuately emarginate. The first and second abdominal segments more deeply impressed than *A. californica* in both sexes. Distal half of posterior lateral margin straight, fimbriae distally curving medially, not following the posterior margin, Length, excluding beak, 2.3 mm., width 0.9 mm.

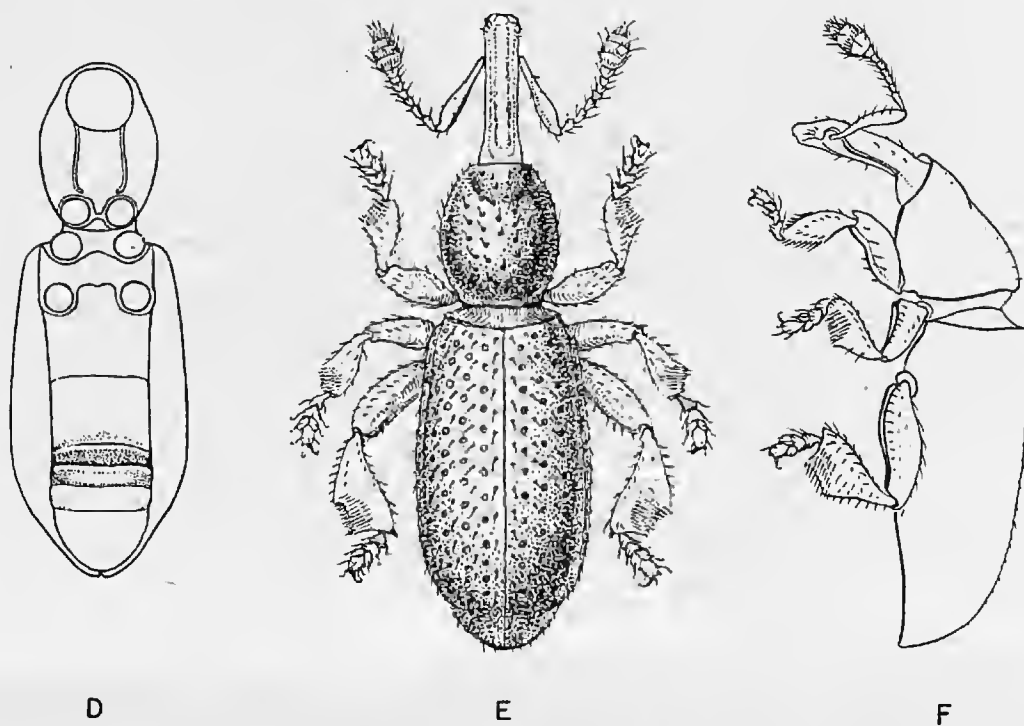
This species appears to be generally more uniform in size and coloration than *A. californica*. Although there is some variation in the length of the antennal segments, *A. rothi* can be

PLATE I

Figs. A-C *Alaocybites californica* Gilbert. A, lateral view; B, dorsal view, with head and beak elevated; C, ventral view. Figs. D-E. *Raymondionymus* (Shizomicrus) *caecus* (Casey). D, lateral view; E, dorsal view, with head and beak elevated; F, ventral view. Magnification 21 times.



ALAOCYBITES CALIFORNICA GILBERT



RAYMONDIONYMUS (SHIZOMICRUS) CAECUS (CSY.)

readily distinguished from *A. californica* by its uniform dull luster, dense pronotal punctation, and probably most noticeably, by the insertion of the head into the prothorax, with the accompanying obliqueness of the anterior lateral margin of the prothorax. The latter characters bring the genus more in accord with the rest of the Raymondionyminae, where the head is concealed, and the oblique lateral margin of the prothorax sometimes approaches an almost horizontal position. There is a variation in length from 1.8 to 2.6 mm., and in width from 0.7 to 0.9 mm.

Holotype female and *allotype* male (Calif. Acad. Sci., Ent.) and thirty-one paratypes collected November 21, 1953, TWO MILES NORTH OF FORT DICK, DEL NORTE COUNTY, CALIFORNIA. The species was collected by Mr. V. D. Roth. Thirty-three specimens were taken from less than fifty pounds of redwood litter.

Genus RAYMONDIONYMUS Wollaston

Although the scope of this genus has apparently been adequately defined, by Ganglbauer, 1906, to include the Old World species, it does not fully include the characters of the related American species. In fact, in one of the following two species, there is not only a marked divergence from the Old World *Raymondionymus*, but also a convergence towards *Aloacyba*, and *Alaocephala* Ganglbauer. Thus, in order to give a full discussion of the characters of the American species, and their discrepancies with the Old World *Raymondionymus*, these characters will be treated following the descriptions, where full use of the specific and individual variation can be employed.

Raymondionymus schusteri Gilbert new species

(Plate II, figs. G-I)

Body very small, shining, narrowly elongate oval, moderately convex above, covered with sparsely placed, erect, pale yellow hairs, which are confused, and do not form single series on the elytra. Head, beak, antennae, femora, third, fourth and fifth abdominal segments ochraceous, rest of body amber; prothorax and elytra dorsally translucent and shining, the venter opaque and dull. Head glabrous, not visible from above, finely and sparsely punctured; beak three-fourths length of prothorax; strongly constricted basally; dorsally asperate and feebly punctate to antennal insertion, slightly thickened basally before constriction, and with carina above antennal insertion small, only slightly laterally prominent at apical third; laterally, subconnate to antennal insertion, then dorsal lateral margin abruptly bent and obliquely angulate in apical third; ventrally trianguliform, broadest at antennal insertion, terminating without a carina at basal fourth of beak; scrobes completely inferior, straight, attaining venter of

head, with dorsal border sinuate, slightly cariniform; antennae inserted slightly before middle, insertion latero-ventral in position; scape robust, claviform, almost attaining venter of head; funicle five segmented, the first segment more robust and longer, second through fifth subequal. Prothorax with anterior lateral margin obliquely horizontal and straight, but basally emarginate; pronotum subovate, widest medially, feebly constricted basally, strongly so apically, the apical constriction demarcating an elevated area,

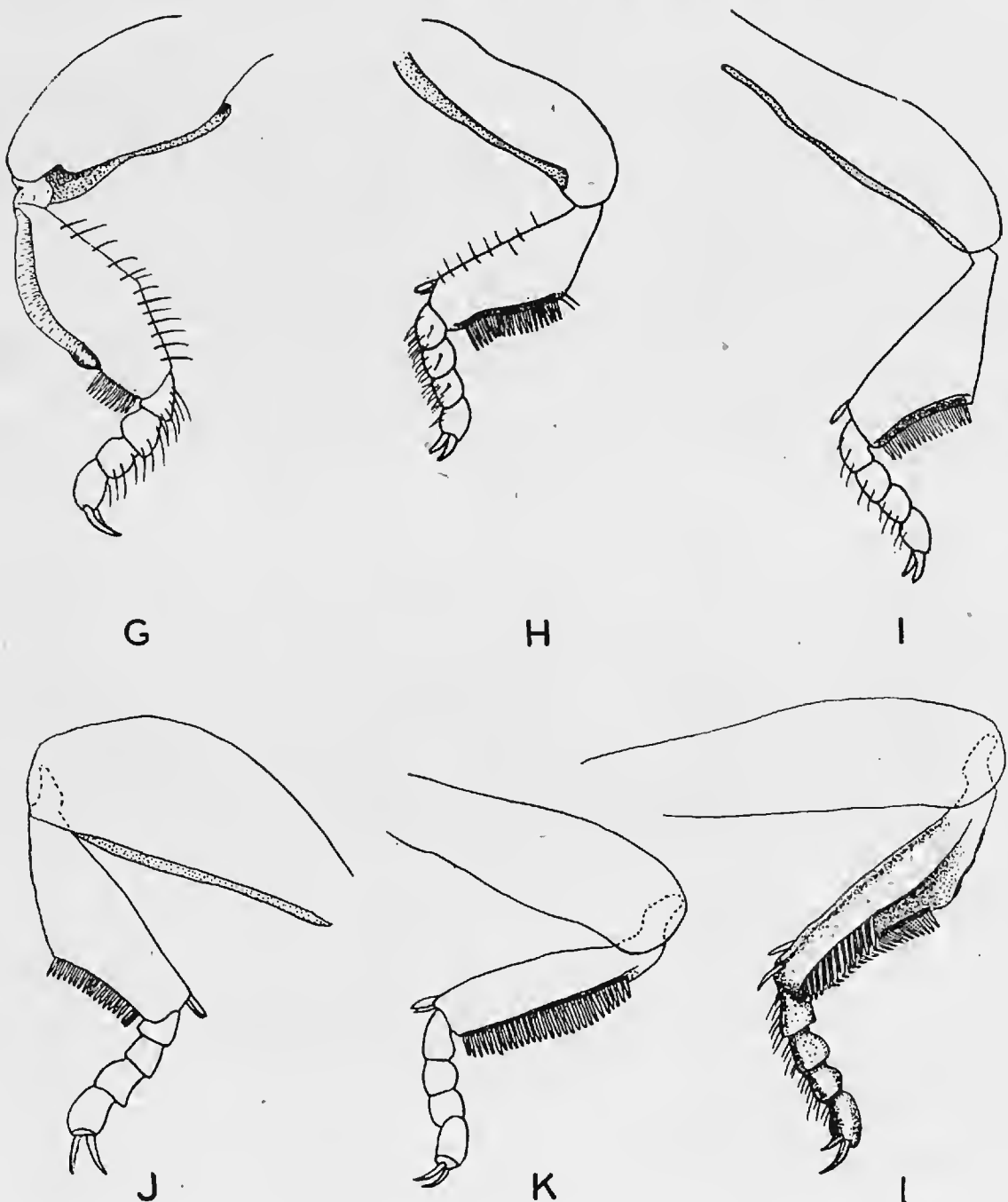


PLATE II

Figs. G-I. The legs of *Raymondionymus schusteri* Gilbert. G, external face of the fore leg; H, internal face of the mid leg; I, internal face of the hind leg. Figs. J-L. The legs of *Raymondionymus helferi* Gilbert. J, external face of the fore leg; K, internal face of the mid leg; L, internal face of the hind leg. Magnification 100 times.

laterally restricted to apical fifth, but mid dorsally gibbosely extended in the form of a hemisphere to apical three-eighths; pronotum coarsely and closely punctate, but without a mid basal coalescence or groove, or medial impunctate area. Scutellum absent. Elytra widest medianly, humeral angles rounded, the base angularly emarginate mid dorsally, sides subconnate to middle, then broadly arcuate to apex, with a slight constriction subapically; apically conjointly rounded; striae and intervals obsolete. *Prosternum* with mid apical margin broadly emarginate; triangularly depressed before coxae, the apical margin widest, with apical extremity of depression declivous only slightly basal to apical prosternal border, lateral border of depression broadly tumescent. Mesosternum only slightly anteriorly depressed. Abdomen with two segments deeply impressed medially; the lateral abdominal margin only slightly constricted between second and third abdominal segments. Legs short, moderately robust; fore coxae subcontiguous, mid coxae barely separated by their own width, hind coxae widely separated; fore femora more robust, mid and hind femora less so, all femora feebly punctate and shining, grooved ventrally for reception of tibiae; tibiae externally trianguliform; fore tibiae short, robust, externally broadly carinate, mid tibiae subequal in length, compressed, hind tibiae longer, greatly compressed. The external angle of the trianguliform tibiae fimbriate on inner margin of all pairs; all tibiae pubescent, but mid tibiae more densely so. Length, excluding beak, 1.1 mm., width 0.4 mm.

Although the translucency remains fairly constant, the body coloration varies from almost completely ochraceous to almost uniformly amber, though the antennae tend to remain more ochraceous. The antennal funicle varies conspicuously, for the first funicular segment may vary in length from half again as large to over twice as large as the second segment, and may also vary in thickness from almost subequal to extremely robust in respect to the second segment. The lateral apical margin of the prothorax varies from straight to broadly sinuate, while the elevated pronotal area may be very prominent, as in the type, or may be nearly obsolete. The lateral margins of the prosternal depression may vary from weakly tumescent to subcarinate. The sexes may be differentiated by the impression of the first and second abdominal segments. Generally males have these segments strongly medially depressed, while females either lack or have only a feeble depression, but there is some overlapping. There is a variation in length from 0.9 to 1.3 mm., and in width from 0.3 to 0.5 mm.

A similar combination of a posternal groove, laterally bordered by a tumescent fold; a five segmented antennal funicle, and subcontiguous fore coxae exists in the European *Raymondionymus benjamini* Marquet. However, *R. schusteri* can be distinguished

than that of the type, so that only the antennal club is ochraceous. The area between the dorsal lateral carina of the beak and the dorsal carinate border of the scrobe may be either smooth and shining, or roughened as it is in the type, but where the surface is smooth, the coloration is usually more ochraceous. The same general variation in antennae, lateral apical prothoracic margin and pronotal elevated area that occurs in *R. schusteri* also appears in this species. However, the lateral borders of the prosternal depression tend to be more tumescent or carinate than in the former species. The mid coxae are described as being separated by less than their width, but this varies, and individuals with the mid coxae separated by their own width are not uncommon. The most noticeable variation concerns the position of the ventral grooves of the fore femora. In the type and part of the series these grooves appear almost as in *R. schusteri*, but may be placed on either the internal or external face of the femora. As previously stated, the mid femora have less of a groove, for while the interior border is complete, the external border is lacking, except at the apex. Although the hind tibiae are also apically grooved, and have the interior border complete, and the exterior border lacking, the intervening area is flattened instead of hollow. However, the position of these areas on both the mid and hind femora is relatively stable. There is also some variation in the size and shape of the tibiae; the degree of constriction of both the beak and prothorax, and the degree of punctation. There is a variation in length from 0.9 to 1.6 mm., and in width from 0.4 to 0.6 mm.

Holotype male and allotype female (Calif. Acad. Sci., Ent.) and two hundred and eighty-eight paratypes. One hundred and eight paratypes from Mendocino, Mendocino County, California, February 14, 1954. The holotype, allotype, and two hundred and eighty paratypes from CASPAR, MENDOCINO COUNTY, CALIFORNIA, March 7, 1954. The entire series was collected by J. Helfer, after whom the species is named.

The combination of characters exhibited by this species does not approach any particular European species, but rather tends to be intermediate between the Old World genera. For example, while the antennal scape extends beyond the basal constriction of the beak as in *Alaocyba*, the scrobes are slightly oblique and thus intermediate between *Alaocyba* and *Raymondionymus*, the

but finely rugose to antennal insertion, and with lateral carina above antennal insertion, dorsally prominent as a small knob, extending posteriorly along the lateral margin to the basal constriction as a small carina; laterally, subconnate to antennal insertion, then dorsally slightly bent to apex; ventrally trianguliform, broadest below antennal insertion, terminating in a carina near base of beak; scrobes slightly oblique, directed under beak, attaining the head ventrally, the dorsal lateral margin sinuate, slightly cariniform, and ventrally delimiting a small obliquely angular depressed area between this carina and the dorsal lateral carina of the beak; antennae inserted slightly in front of middle; insertion dorso-lateral in position; scape short, robustly claviform, attaining venter of head; funicle five segmented, the first segment longer, and slightly more robust, the second through fifth short, subequal. Prothorax with anterior lateral margin obliquely vertical, and broadly sinuate, basally truncate and emarginate; pronotum subelliptical, slightly constricted at apical fourth, delimiting a feebly elevated area that extends mid dorsally to apical third; very feebly constricted at basal third; pronotum coarsely and closely punctate, the punctures coalescent mid basally, forming a short medial groove. Scutellum absent. Elytra widest medianly, broadly and angularly emarginate basally, sides subconnate to middle, then broadly arcuate to apex, with a slight constriction near apex, apically conjointly rounded; length twice that of prothorax, less than twice their combined width; intervals and striae not confused, intervals subequal to striae, feebly raised, convex, shining, with small punctures distantly separated in a single series, each with an erect, pale yellow hair arising from the center; striae with punctures deep, separated by half their own width with ridges confluent with intervals. *Prosternum* with mid apical margin broadly emarginate and arcuate, deeply and triangularly depressed before coxae, the depression widest subapically, and bordered there by an abrupt declivity; the lateral borders of the depression strongly carinate. *Mesosternum* strongly depressed anteriorly. Abdomen with first two segments deeply impressed medially; the lateral abdominal margin constricted between the second and third abdominal segments. Legs short, moderately robust; fore coxae subcontiguous, mid coxae separated by less than one-half their own width, hind coxae widely separated; femora finely punctate and shining, except fore femora externally; fore femora more robust, grooved ventrally for reception of tibiae; mid femora less robust, hollow ventro-laterally; hind femora less robust than the fore, with a ventral groove near apex, the rest with the anterior edge angularly prominent, the internal edge reduced; thus appearing ventrally wedge-shaped; tibiae finely punctate and shining; fore tibiae robust, short, trianguliform; mid tibiae subequal in length, subparallel, not compressed; hind tibiae narrowly and obtusely trianguliform, not compressed. The fimbriae prominent on the internal margin of the fore tibiae, and on both the internal and external margins of the mid and hind tibiae. Length, excluding beak, 1.4 mm., width 0.5 mm.

The opaqueness and coloration of the dorsal surface remains constant, but the color of the appendages may be uniformly darker

from the former species by having a shorter more robust beak, which lacks a ventral carina, with the antennae inserted near the middle instead of near the apex, by the confused elytral punctuation, and by having the fore tibiae carinate.

Holotype male and allotype female (Calif. Acad. Sci., Ent.) and twenty-two paratypes. One paratype from Alpine Lake, Marin County, California, June 18, 1953, collected by R. O. Schuster and C. D. MacNeil; the holotype, allotype, and twenty-one paratypes were collected NEAR THE SOUTH ENTRANCE OF SAMUEL P. TAYLOR STATE PARK, MARIN COUNTY, CALIFORNIA, in the following sequence of dates, by the following collectors: three paratypes collected October 24, 1953 by V. D. Roth; the holotype, allotype, and thirteen paratypes collected November 1, 1953 by R. O. Schuster, V. D. Roth, and E. E. Gilbert; five paratypes collected November 8, 1953 by R. O. Schuster, G. A. Marsh, V. D. Roth, and E. E. Gilbert.

The holotype, allotype, and ten paratypes, of the fifteen specimens collected November 1, 1953, were taken from the interior of a redwood log which was in the last stages of decay. Thus over half of the material collected came from about five pounds of decayed redwood from part of a log, while over one hundred pounds of litter collected from the floor of the redwood groves, and alongside the bases of healthy trees, yielded only ten specimens. The only teneral specimen taken, was collected on the floor of the redwood grove, and probably emerged in the litter while the latter was in the laboratory, since the material was retained a few days before it was placed in a berlese funnel.

This species is named after R. O. Schuster, who either directly through collecting, or indirectly, with the use of berlese funnels, supplied the major portion of the material included in this paper, and who also prepared the majority of the specimens for study.

***Raymondionymus helferi* Gilbert, new species**

(Plate II, figs. J-L)

Body small, narrowly elongate oval, moderately convex above, covered with sparsely placed erect pale yellow hairs, which form single series on elytral intervals. Antennae and tarsi ochraceous, rest of body red-brown, head and appendages lighter and more shining, except fore femora, which, externally, like the rest of body, is darker and uniformly dull. Head glabrous, feebly shining, with large sparsely placed punctures; not visible from above; beak two-thirds as long as prothorax, constricted basally; dorsally, slightly constricted near middle, widest before base, impunctate

hind femora exhibit ventrally a vestige of the groove present in *Raymondionymus*, and completely absent, on all femora, in both *Alaocyba* and *Alaocephala*. The ventral carina of the beak, absent in *Alaocyba*, and also *A. schusteri*, is present only at the base of the beak, and thus intermediate between *Alaocyba* and *Alaocephala* and *Raymondionymus*. The mesosternum is depressed strongly as in *Raymondionymus*, not only slightly as in *Alaocephala* and *R. schusteri*. This species differs from the rest of the *Raymondionyminae* by possessing a double row of fimbriae on the mid and hind tibiae. However, considering these discrepancies, the presence of a moderately convex body, a beak with a ventral basal carina, a five segmented funicle, strongly depressed pro- and mesosterna, and ventral femoral grooves, complete at least on the fore femora, provides a strong indication that this species is more closely related to the genus *Raymondionymus* than to other European genera. This species may be readily distinguished from other species of *Raymondionymus* by the characters listed above.

RAYMONDIONYMUS (SHIZOMICRUS) CAECUS Casey
(Plate I, D-F)

A collection of nearly one hundred and fifty specimens of this species has indicated that there is a large degree of variability, not only in size, but in characters found to be variants in both *R. schusteri* and *R. helferi*. Thus there is a conspicuous variation in antennal segmentation, such that the form may vary from a moniliform segmented funicle to a strongly clavate one, the second and third funicular segments may be either conspicuously narrower or subequal to the rest of the funicle. The dorsal lateral margin of the prothorax may vary from straight to broadly sinuate, while the pronotal sculpture may vary from sparsely to heavily and closely punctate; the elevated area of the pronotum may vary in a manner similar to *R. schusteri* and *R. helferi*. The fore femora may be completely grooved, or only anteriorly grooved and posteriorly carinate, with the external surface broadly impressed. The prosternal sulcus varies only in degree, and remains carinate throughout the series. There is a variation in length from 1.4 to 2.6 mm., and in width from 0.5 to 1.4 mm.

The range of distribution of this species extends from Navarro ridge road, southern Mendocino County, where it was collected with *Alaocybites californica*, southeastward to Napa County, and southward to lower Santa Cruz County. The species is fairly abun-

dant in redwood litter throughout the year, and although it appears to replace *Alaocybites* geographically, it is as abundant in very shallow dry as well as deep litter. The type was collected by Mr. Charles Fuchs, and recorded by him as collected at Samuel P. Taylor State Park, Marin County.

R. caecus, except for the seven-segmented antennal funicle, resembles the Old World species of *Raymondionymus* very closely. Like *Raymondionymus*, the scrobes are inferior, separated by a long carina, the antennae does not pass the base of the beak, the prosternum is grooved, the mesosternum strongly anteriorly depressed, the femora all grooved ventrally to receive the tibiae, and the tibiae are all dilated and fimbriate, the mid and hind tibiae being very strongly compressed. Since *Raymondionymus* has species with both five and six segmented funicles, the generic status of *Shizomicrus* Casey, based as it is on a seven segmented funicle, is considered no longer valid, and *Shizomicrus* is therefore regarded as a subgenus of *Raymondionymus*.

THE GENERIC LIMITS OF RAYMONDIONYMUS

Mainly because of a lack of specimens of both *Alaocyba* and *Alaocephala*, the morphological evidence derived solely from the California species does not warrant either the proposal of a new genus, nor the synonymy of *Alaocephala*. Genitalic characteristics of the American species have not been discussed, though they appear to provide good criteria, because they could only be correlated with those of the Old World *Raymondionymus*. Perhaps, with the European material, and a more complete representation of the American species, a comparison of New and Old World species could be undertaken. At the present time, however, it seems wiser to merely broaden the generic limits of the genus *Raymondionymus* to include the California species. Nevertheless, in doing so, certain characters can be best explained in reference to *Alaocyba* and *Alaocephala*, but in these cases the degree of difference will remain uncertain.

Although the differences of both *Raymondionymus schusteri* and *R. helferi* with the Old World *Raymondionymus* are actually few in number, they combine characters, used by Ganglbauer, to separate the European Raymondionymine genera. Further, the combination of these characters is different in each California species. For example, in *R. schusteri* the scrobes are ventral, like *Raymondionymus*, but not separated by a carina, a characteristic

of *Alaocyba*. However, in *R. helferi* the scrobes are oblique, like *Alaocyba*, but separated ventrally by a carina, as in *Raymondionymus*. Again, in *R. schusteri* the femora are all ventrally grooved, like *Raymondionymus*, while the mesosternum is only slightly anteriorly depressed, a feature of *Alaocephala*. In *R. helferi* only the fore and mid femora are grooved, and it is thus intermediate between *Raymondionymus* and both *Alaocyba* and *Alaocephala*, while the mesosternum is strongly depressed, as in *Raymondionymus*. Both *R. schusteri* and *R. helferi* have the antennae inserted just before the middle so that the scape, even though short, passes the basal constriction of the beak, like *Alaocyba*. A possible explanation for variation in beak characters, that are stable in the Old World genera, may involve the position of the scape, when the weevils are in their death feinting pose. In *R. caecus* and the Old World *Raymondionymus* the scape does not attain the basal constriction of the beak, and thus, when the head and beak are rotated ventrally, the scape cannot touch the prothorax. However, in both *R. schusteri* and *R. helferi* the scape passes the basal constriction of the beak, and when the head and beak are rotated ventrally, is held in repose between the emarginate basolateral apex of the prothorax and the lateral dorsal carinate margin of the scrobe. Therefore when the antennal scapes pass the basal constriction of the beak there is a tendency towards, either loss of the ventral carina of the beak, *R. schusteri*, acquisition of oblique scrobes, *R. helferi*, or both, *Alaocyba*.

That these two species are close to *Raymondionymus*, and not to the other Old World genera is attested by the grooved femora, at least in one pair of legs, the relatively convex body, and the depressed prosternum. Also, the fact that the characters which resemble the other Old World genera, are in a different combination, part of which reflects the genus *Raymondionymus*.

THE EVOLUTION OF THE RAYMONDIONYMINAE

(Fig. 1)

Several morphological trends are evident in the Raymondionyminae. It seems fairly obvious that in the genus *Alaocybites* many of these either initiate or terminate. For example, the head, which at most is only partly visible in other Raymondionyminae, becomes completely visible in *A. californica* (Plate I, B), while the beak is slightly longer in this genus than in any other. The antennal scrobes are completely lateral in this genus, and the

funicle is seven segmented; in *Alaocyba* and *R. helferi* the scrobes are oblique, and the funicle is six and five segmented respectively. The remaining Raymondionyminae have the scrobes completely ventral, and the funicle segmentation may vary from seven (*R. caecus*) to five segments. *Alaocybites* has the area before the fore coxae tumid, while in *Alaocyba* and *Alaocephala* this area is simple, but usually deeply impressed or sulcate in *Raymondionymus*. *Alaocybites* possesses the most simple leg type, for the tibiae are not broadly dilated, and the femora not ventrally grooved; also, the abdominal segmentation is distinct, the third, fourth, and fifth sutures being more distinctly impressed. There occurs, in some species, a few characters which approach a "simple" condition, but corallary characters denote an origin manifestly different. Probably the best example of this is shown in the development of the subparallel mid-tibiae of *R. helferi*. In this species the tibiae are not dilated, which might indicate the reverse process had taken place, that is proceeding from a primitive dilated to the more advanced undilated condition, if it were not for the

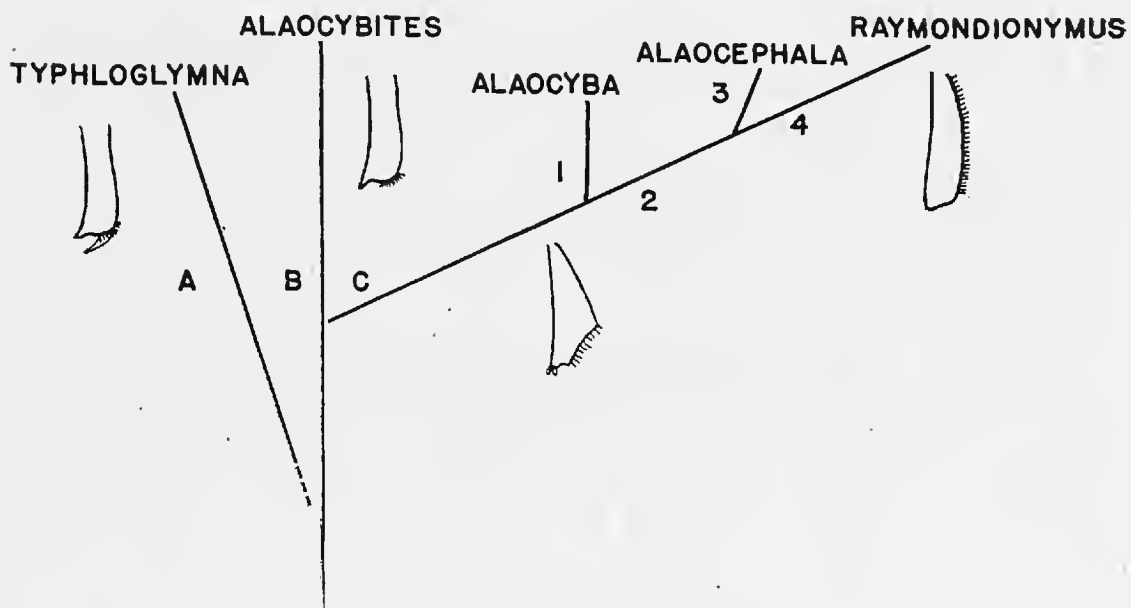


Figure 1. The theoretical relationships of the subfamily Raymondionyminae, with a key to the genera.

A. Tibial spurs present, tarsi with small ventral pads (Hylobiinae, Anchonini).

B. Tibial spurs absent, tarsi without ventral pads (Raymondionyminae). Tibiae not dilated; scrobes completely lateral.

C. Tibiae dilated; scrobes either (1) directed obliquely under beak, not separated by a carina ventrally, or (2) completely ventral, or if directed obliquely downward, separated by a carina ventrally. All femora grooved ventrally: (3) at apex, or (4) throughout, for the reception of the tibiae.

fimbriae. This development is illustrated by figure 1, where the tibiae are drawn diagrammatically in a series from *Alaocybites* to the mid-tibiae of *R. helferi* (also figured on Plate II, fig. K). Here the fimbriae follow the external apex of the tibiae in *Alaocybites*, bordering the external groove for the reception of the tarsi. In *R. caecus* the same is true, except that the external angle of the tibiae has become greatly dilated, and compressed. This is true in *R. schusteri* (Plate II, figs. G–I) as it is in most of the Raymondionyminae. Where the tibiae become only narrowly triangular, the external angle may be extended basally. This can be seen in the hind legs of *R. helferi* (Plate II, fig. 1). Along with this modification there is a development of two rows of fimbriae, which serve in the same manner as the external groove of *Alaocybites*. The further development in the mid legs of the latter species is merely an increase in the external flattening, where the fimbriae follow the external angle almost to the base. This general evolutionary trend may also apply to the fore legs of some of the Old World Raymondionyminae (*Alaocyba*, *R. marqueti* Aubé, *R. stygius* Rost). The development of the beak, antennae, and prosternum could be similarly, but not as completely, followed. However, evidence for the development of the ventral femoral grooves is completely lacking, and what evidence that can be seen, points in the opposite direction. As was previously shown, *R. helferi* shows this process in operation. In fact, it is not improbable that the progenitors of *Alaocybites* did have femoral grooves, for there is no direct correlation between these and the tibial dilation, as evidenced by *Alaocyba* and *Alaocephala*, which lack complete grooves, but have the tibiae dilated. From this evidence *Alaocybites* appears to be more primitively derived, while *Alaocyba* and *Alaocephala* were apparently derived from a stock, which in many respects, was more similar to the modern *Raymondionymus*, especially *R. caecus*.

The only genus found that appears close to this group is *Typhloglymna* Dury, currently placed in the Anchonini of the Hylobiinae. Many Raymondionymine characters are present in this genus. For example, the head is partially inserted in the prothorax, and is smooth and glabrous, the beak is not externally dilated, but strongly constricted basally, the antennae are inserted near the apex, the scutellum is absent; the pronotum and elytra

are similar in shape, measurements, and setation, while the position of the coxae are well within the Raymondionymine limits. The tibiae are externally fimbriate (Fig. 1), and the abdomen is very similar to *Alaocybites*. Some of the other characters are close to individual Raymondionymine species. As in *R. helferi*, the scrobes are oblique and separated ventrally by a carina, but the antennal scape does not pass the basal constriction of the beak, as in *R. caecus*, and the Old World *Raymondionymus*. The antennal funicle is seven segmented, like *Alaocybites* and *R. caecus*. The tibiae are not only undilated as in *Alaocybites*, but similarly rugosely sculptured. However, *Typhloglymna* lacks the external tibial groove. Although the abdomen, like *Alaocybites*, has the third, fourth and fifth sutures deeply impressed, the third and fourth abdominal segments are not similarly angularly impressed. The setation is very similar to the Raymondionyminae, and thus includes fine, sparsely placed, erect, yellow hairs on the elytral intervals (in a single series), the fifth abdominal segment, and on the coxae. However, these hairs are more evident on the venter than those of the Raymondionyminae studied.

However, there are two main, and supposedly basic, differences that do not permit this genus to be included in the Raymondionyminae. The first is the presence of a well-developed recurved tibial spur, lacking in all Raymondionyminae; and the second, the tarsi. The tarsi in the Raymondionyminae are very unique. The segments are large, and subcuboid, the fourth being only slightly longer than the third in length, and subequal to the other segments in thickness. The segments are covered with a long and fairly dense pubescence, but lack completely any ventral pads. In *Typhloglymna*, however, the tarsi are like those of the majority of the Hylobiines, being small, and elongate, with the fourth segment long and very slender. The segments have small lateral ventral pads of short pubescence, and lack the long hairs common to all Raymondionyminae.

In addition, there is a marked similarity between *Typhloglymna* and the Raymondionyminae, and even though its characters are not consistent with any particular species, these characters are expressed in other combinations within this subfamily.

On the present evidence, it would be impossible to derive the Raymondionyminae from the Anchonini of the Hylobiinae, but I believe the closest relationship lies in this group. It would be

wise, therefore, to place the Raymondionyminae in the Curculionidae, immediately following the Hylobiinae, on the presumption that although there can be seen no direct line of evolution.

ACKNOWLEDGEMENTS

I would like to thank R. O. Schuster for collecting and preparing a large part of the material used in this study, and H. B. Leech for furnishing additional material of American and European representatives of the group. Thanks are also due to Mrs. Abernathy for illustrating the species on Plate I, and to Dr. M. B. Sanderson for furnishing a specimen of *Typhloglymna* for study.

LITERATURE CITED

CASEY, THOMAS L.

1892. Appendix to coleopterological notices IV. Annals N. Y. Acad. Sci., 6:359-721.

CROISSANDEAU, J.

1896. Étude sur les genres *Alaocyba*, *Torneuma* et *Amaurorrhinus*. Il Naturalista Siciliano, 15:21-40, 111-120, pl. 1-V.

DURY, CHARLES

1901. A new calandrid from Cincinnati, Ohio. Jour. Cin. Soc. Nat. Hist., 19:243-244.

GANGLBAUER, L.

1906. Revision der blindrüsslergattungen *Alaocyba* und *Raymondionymus* Münch. Kol. Zeitschr., 3:135-170.

HUSTACHE, A.

1930. Curculionidae Gallo-Rhénans. Ann. Ent. Soc. Fr., 99:6-872.

PERRIS, M. E.

1869. Descriptions de quelques coléoptères nouveaux. L' Abeille, 7:1-37.

WOLLASTON, T. V.

1873. On the genera of the cossonidae. Trans. Ent. Soc. Lond., pp. 427-657.